

8. An interface apparatus as recited in claim 6 further comprising two capstan drive mechanisms, each coupled between one of said actuators and said closed loop linkage, wherein

each of said capstan drive mechanisms includes a drum coupled to said carriage and a pulley coupled to one of said actuators, wherein a member of said linkage is coupled to said drum, and wherein said drum is coupled to said pulley by a cable such that said actuator is operative to rotate said pulley and thereby transmit force to said linkage with no substantial backlash.

9. (amended) An interface apparatus as recited in claim [2] 1 wherein said user manipulable object includes a stylus.

10. (amended) An interface apparatus as recited in claim [2] 1 wherein said user manipulable object includes at least a portion of a medical instrument.

11. (amended) An interface apparatus as recited in claim [4] 1 further comprising a floating gimbal mechanism coupling said one of said plurality of members to said user manipulable object to provide rotational movement for said object in a fourth degree of freedom.

12. An interface apparatus as recited in claim 11 wherein said floating gimbal mechanism provides rotational movement for said user manipulable object in a fifth degree of freedom.

13. An interface apparatus as recited in claim 12 further comprising:

a fourth degree of freedom transducer coupled between members of said floating gimbal mechanism; and

a fifth degree of freedom transducer coupled between members of said floating gimbal mechanism.

Please cancel claim 14 without prejudice.

15. An interface apparatus as recited in claim 12 wherein said user manipulable object is rotatable about a longitudinal sixth axis of said object to provide a sixth degree of freedom for said object, and further comprising a sixth degree of freedom transducer coupled between said object and said floating gimbal mechanism.

Please cancel claims 16-21 without prejudice.

22. (amended) A method [mechanical interface apparatus] for interfacing motion of a user manipulable object with a computer system, said [interface apparatus] method comprising:

providing a user manipulable object being physically contacted by a user;

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providing at least three degrees of freedom to said user manipulatable object using a 3-D spatial mechanism coupled to said user manipulable object and including a plurality of members including a ground member rigidly coupled to a ground[, said spatial mechanism providing at least three degrees of freedom to said user manipulable object];

[a sensor for] detecting a position of said user manipulable object in three-dimensional space and outputting sensor signals to said computer system.

24. (amended) A [mechanical interface apparatus] method as recited in claim 23 further comprising transmitting force to said linkage with no substantial backlash using two capstan drive mechanisms, each coupled between one of said first and second actuators and said plurality of members, wherein each of said capstan drive mechanisms includes a drum coupled to one of said members and a pulley coupled to one of said actuators, wherein a member of said linkage is coupled to said drum, and wherein said drum is coupled to said pulley [by said cable such that said actuator is operative to rotate said pulley and thereby transmit force to said linkage with no substantial backlash].

26. (amended) A [mechanical interface apparatus] method as recited in claim 25 wherein said two of said degrees of freedom are in a planar workspace provided by a parallel link mechanism, and a third of said degrees of freedom is provided by rotating said parallel link mechanism about an axis with respect to said ground member.

a user manipulable object graspable by a user;

transmission means for transmitting force [a capstan drive coupled] between said user manipulable object and said actuator, said [capstan drive] transmission means including [a] capstan drum means coupled to said user manipulable object and rotatable about a first axis and [a] rotatable pulley means coupled to and rotatable by said means for providing a force [actuator], wherein a flexible member is coupled between said drum means and said pulley means to transmit rotational force between said drum means and said pulley means; and

whereby said user manipulable object is provided with a first degree of freedom about said first axis and a second degree of freedom about said second axis.

Please cancel claim 29 without prejudice.

31. (amended) A mechanism as recited in claim 30 further comprising [a] second [capstan drive] transmission means, said second capstan [drive] transmission means including:

a second [capstan] drum means coupled between said user manipulable object and said carriage means and rotatable about a third axis to allow said user manipulable object to be moved in a planar workspace having said first degree of freedom and a third degree of freedom;

[a] second pulley means coupled to said second actuator[, said second pulley] and being coupled to said second capstan drum by a second flexible member.

33. (amended) A mechanism as recited in claim 32 further comprising a third [capstan drive] transmission means coupled between said carriage and said third [actuator] means for outputting a force, said third [capstan drive] transmission means including [a] third [capstan] drum means rigidly coupled to said carriage means and rotatably coupled to said ground surface, [a] third pulley means coupled to said third [actuator] means for outputting a force, and a third [flexible] flexible member coupled between said third drum means and said third pulley means.

35. (amended) A mechanism as recited in claim 27 wherein said user manipulable object is one of a stylus and a medical instrument.

37. (amended) A mechanism as recited in claim 30 wherein said user manipulable object is coupled to said linkage means [of members] by [a] floating gimbal [mechanism] means for providing [that provides at lesat] at least two additional degrees of freedom to said user manipulable object.

**Please add the following claims:**

57. (new) An interface apparatus as recited in claim 37 wherein said floating gimbal mechanism includes at least one capstan drive mechanism and at least one sensor, said capstan drive mechanism providing enhanced sensing resolution to said sensor.

[illegible]